Commonwealth of Kentucky
Division for Air Quality

PERMIT STATEMENT OF BASIS

Federally Enforceable Conditional Major Draft Permit - No. F-05-0015 Revision 1
Uranium Disposition Services, LLC
5600 Hobbs Road
Paducah, KY 42001
July 24, 2007
SANDRA COOKE, REVIEWER

SOURCE ID:	21-145-00091
AGENCY INTEREST:	49944
ACTIVITY:	APE20070001

SOURCE DESCRIPTION:

The proprietary process to be used to convert spent uranium at this facility was developed and is owned by AREVA NP. The process is currently in use at a site in Richland, Washington that is licensed by the U.S. Nuclear Regulatory Commission and will also be used on the U.S. Department of Energy (DOE) reserve in Portsmouth, Ohio. AREVA NP has combined with Burns and Roe, an engineering and construction firm, and Duratek, of Oak Ridge Tennessee, to form Uranium Disposition Services, LLC (UDS) that is responsible for the design, construction and operation of this proposed facility. UDS requested confidentiality for the processes and specific equipment to be used in this project and the Division agreed. The unique nature of the processes and facility are within the scope of ***trade secret*** as claimed and the project is therefore entitled to confidential treatment pursuant to 400 KAR 1:060, ***Confidentiality of records or other information furnished to or obtained by the Natural Resources and Environmental Protection Cabinet***. Therefore, only a brief description of the facility is included here:

Four Parallel process lines are used to convert depleted uranium hexafluoride (DUF_6), currently stored in cylinders by DOE, to uranium oxide powder, aqueous hydrogen fluoride (HF), and calcium fluoride (CaF_2). The process takes the material through vaporization, conversion, HF recovery, and off-gas scrubbing. The resultant high purity HF is collected and marketed. The remaining low-level uranium oxide powder is loaded into emptied UF_6 cylinders for disposal. CaF_2 is generated during the regeneration of potassium hydroxide (KOH). The facility has only two emission points, the first of which, emission point 01, is the stack of the Conversion Facility Building. This concrete building is kept at a negative pressure relative to the outside ambient pressure. Continuous welded-joint piping used for much of the process provides containment protection. Where flanged connections are required, hotboxes, vented through a HEPA filter, assure containment of gasses. This building also houses the Oxide Handling Systems. Piping and vessels provide primary containment for this function and vented hoods collect and send any emissions through a pre-filter, a HEPA filter, and then the final HEPA bank before exhausting out the stack. The cylinder modification and stabilization systems are also contained in this facility. A controlled ventilation system, containing pre-filters and HEPA filters, will handle all building and process gasses prior to venting to the final HEPA exhaust filter bank and the monitored facility stack. Emission point 01 accounts for the majority of all process emissions. Many safety systems, in addition to the controlled ventilation system and containments, are incorporated into the design throughout the facility to prevent releases of gasses, solids, or liquids to the building interior or to the environment. Central control systems monitor all aspects of the conversion process, including temperature and pressure, and automatic building monitors check for chemical leaks. Pressure vessels are designed to American Society of Mechanical Engineers (ASME) standards and fail-safe design, in the event of power or instrument air loss, is used for valving and control systems.

The aqueous HF acid produced during this process will be periodically pumped from the HF receiver tanks to the HF storage tanks for subsequent load-out. These tanks are located within a secondary containment sump with leak detection and continuously operated detectors monitoring the air near the tanks. Air displaced within the tanks, or transport vehicles, is vented through a caustic scrubber.

REVISION 1 CHANGES:

All HF will be sold at the 55% strength resulting from the conversion process. Because of this, there is no longer a need for an HF Neutralization Building. The Original EP02, located at the stack for the HF Neutralization Building, has been replaced by the new EP02, located in the HF loading area. This revision removes the neutralization process and building from the permit and adds additional pollution control equipment to the HF loading area. Air that is displaced during the filling and emptying of the HF Storage tanks and transport vessels is now directly vented through dedicated scrubbers/control equipment rather than being routed into one of the two original facility buildings. The exit from the scrubber/control equipment in this area is now designated as Emission Point 02. The tanks, and all equipment involved with processing or storing aqueous HF, are designed for acid service. No radioactive materials enter this process or are vented through Emission Point 02.

This revision also removes the requirement to closely monitor the temperature across the HEPA pre-filters and filters. Temperatures in the ambient areas around the HEPA filters are maintained at approximately 80º F with controls to ensure temperatures do not exceed 100ºF. The process itself is maintained around 93º F. Since HEPA filters use a glass fiber, efficiency is not affected by temperature. The filters will continue to work until either the bonding materials or the glass fibers themselves breakdown and/or melt. An event that could cause a temperature high enough to cause a breakdown in a HEPA filter, such as a fire, would cause the safety systems to shut down the process long before a melting temperature could be reached. There would be no flow across the filters by the time a temperature high enough to affect efficiency could be reached. At the other temperature extreme, cold causing the formation of crystals within the filter, and thereby reducing efficiency, is not plausible because the process temperature itself is around 93 ºF and the automatic controls, with temperature sensors, would shut down the process before it could become cold enough to cause any problem. The automatic safety systems for the process, coupled with the controlled HVAC and emergency systems within the building itself make monitoring and recording temperatures across the HEPAs meaningless for compliance purposes. The most important parameter to monitor to ensure efficiency across the filters is the pressure, as a change in pressure can indicate clogging or breach (puncture). Pressure monitoring remains in the permit. Removal of the temperature monitoring represents a relaxation of the monitoring and recordkeeping requirements and therefore caused this revision to the permit to be a significant revision pursuant to 401 KAR 52:030, Section 16.

INITIAL ISSUE:

EMISSION AND OPERATING CAPS DESCRIPTION:

(Continued in Table, next page)

Emission caps are as follows:

Emission Point	Pollutant	Allowable	Applicable Regulation
01 (U001)	Radio-activity	• The emissions of radionuclides from this source to the ambient air shall not exceed those amounts that would cause any member of the public to receive in any year an effective dose equivalent of 10 mrem/yr as defined and prescribed in 40 CFR 61 Subpart H (61.90 through 61.97).	401 KAR 57:002
	PM	• At an approximate process weight rate of 3 Tons(English)/Hour, the hourly particulate allowed by 401 KAR 59:010 would be 7.09 lb/hr.	401 KAR 59:010
	HF	• The source is in compliance with 401 KAR 63:020 based on the emission rates of toxics given in the application submitted by the source. If the source alters process rates, material formulations, or any other factor that would result in an increase of toxic emissions, the source shall submit the appropriate application.	401 KAR 52:030 401 KAR 63:020
		• Source-wide total release of HF must remain below 9 tons/year	401 KAR 52:030
	Opacity	• The opacity allowable is 20%. The source is in compliance with 401 KAR 59:010 based on the emission rates and type of emissions giving in the application submitted by the permitee. If the permitee alters process rates, material or any other factor that would result in an increase of emissions, the permitee shall submit the appropriate application forms and modeling to show that the facility will remain in compliance with 401 KAR 53:010. Submissions shall be made in a timely manner pursuant to 401 KAR 52:030	401 KAR 59:010 401 KAR 52:030

	PM	• At an approximate process weight rate of 3 Tons(English)/Hour, the hourly particulate allowed by 401 KAR 59:010 would be 7.09 lb/hr.	401 KAR 59:010
	HF	• The source is in compliance with 401 KAR 63:020 based on the emission rates of toxics given in the application submitted by the source. If the source alters process rates, material formulations, or any other factor that would result in an increase of toxic emissions, the source shall submit the appropriate application.	401 KAR 52:030 401 KAR 63:020
02 (U002)	Opacity	• Source-wide total release of HF must remain below 9 tons/year	401 KAR 52:030
		• The opacity allowable is 20%. The source is in compliance with 401 KAR 59:010 based on the emission rates and type of emissions giving in the application submitted by the permitee. If the permitee alters process rates, material or any other factor that would result in an increase of emissions, the permitee shall submit the appropriate application forms and modeling to show that the facility will remain in compliance with 401 KAR 53:010. Submissions shall be made in a timely manner pursuant to 401 KAR 52:030.	401 KAR 59:010 401 KAR 52:030

Radionuclides and Particulate

The emission of particulate from the Conversion Building would be in the form of the Oxide Powder. At an approximate process weight rate of 3 Tons (English)/Hour, the particulate allowed by 401 KAR 59:010 would be 7.09 lb/hr. However, since this material is of a (low-level) radioactive nature, the effective dose equivalent may become the ruling factor for this emission. That is, the maximum allowable particulate may actually be well below the 7.09 lb/hr allowed by 401 KAR 59:010.

A NESHAP analysis was performed by the facility using conservative assumptions, a credible controlled and uncontrolled release, an Appendix D calculation (under 40 CFR 61 Subpart H), and a Worst Case Scenario release that includes a catastrophic, simultaneous failure of several safety systems to provide a bounding case. Results of the credible accidental releases show that public exposure to radiation, resulting from such releases, would be well below 1% of the standard level established in 40 CFR 61.92. However, the releases analyzed that are not deemed credible, but were included to provide a bounding case, show there is a possibility to exceed 1% of the standard level. Therefore constant monitoring is required, in accordance with 40 CFE 61.93(4)*ii*, and continuous monitoring is included in the design specification of the facility and is emphasized in the permit.

Other transuranics and impurities

UDS cites its experience at the Richland, Washington site to show that other radionuclides, besides uranium, may be present in the depleted cylinders. Possible radionuclides include some transuranics (TRU) and technetium. Of these, only the neptunium is volatile. All other components would stay in the heel of the cylinder during vaporization and would not exit the cylinder. The cylinder heel would then be disposed of in a low level waste site. A neptunium impurity, which is volatile, would react just like uranium and become a solid oxide in the conversion unit. It would process through the facility along with the uranium oxide and would be entrapped by the same filtering systems that prevent the release of excess amount of uranium. AREVA NP cited the Richland experience where they were able to process TC-99 levels up to 20 times the level of uranium in the DUF_6 material and elevated TRU contaminants up to 30 times as active as the level of uranium in the DUF_6 materials without adverse affects on the operation or maintenance of their facility.

HF:

UDS analyzed the potential impact of site related and regional sources of HF on ambient air concentrations near the proposed project though the use of the ISC3 air dispersion model. Using all sources within 50 kilometers of the Paducah Gaseous Diffusion Plant Site as well as the predicted amount of HF emissions from the new facility show that predicted concentrations are within the 12 and 24 hour standards established in 401 KAR 53:010.

Construction Particulate

At the Division's request, UDS also provided an analysis of potential Paducah reservation soil contaminants that could possibly become airborne during the construction phase of the project. The soil in the area in which the Conversion facility will be built was examined during the Northwest Plume Investigation, the Groundwater Phase IV Investigation and the WAG 28 Remedial Investigation projects on the Paducah site. Borings of soil from the target area had been taken and analyzed during these earlier investigations and the results of these were used in the UDS assessment of construction site soils. Conservative assumptions and worst-case scenarios were used in the new analysis of potential organic, airborne metals and airborne radionuclide exposure to the public during facility construction. The results show concentrations for these three types of pollutants at 6, 4 and 1 order of magnitude below any level of concern for that pollutant, respectively. Although this potential pathway of exposure is of no concern for the public, the source will still be under requirements to minimize dust generation and construction site run-off in accordance with 401 KAR 63:010, Fugitive emissions.

c. Comments:

1. **Emission factors and their source**:
   Emission factors are based on AREVA NP's operating experience at the Reactor Fuel Fabrication Facility in Richland, Washington. The source has provided credible calculations utilizing conservative assumptions to the Division in estimating emissions expected from the Paducah, Kentucky facility. Initial testing and continuous monitoring of the new facility will be used to verify emissions estimates and to ensure compliance with regulatory emissions requirements.

2. **Applicable regulations:**
   401 KAR 52:030, Federally enforceable permits for non-major sources.

   401 KAR 53:010. Ambient air quality standards.*

*for the Gaseous Fluorides, Total Fluorides

401 KAR 57:002. 40 C.F.R. Part 61 national emission standards for hazardous air pollutants. This incorporates, by reference, 40 C.F.R. Part 61, Subpart A, *General Provisions* and 40 C.F.R. Part 61, Subpart H, *National Emission Standards For Emissions of Radionuclides Other than Radon from Department of Energy Facilities.*

401 KAR 59:010. New process operations.

401 KAR 63:010. Fugitive emissions.

401 KAR 63:020. Potentially hazardous matter or toxic substances.

902 KAR 100:015. General Requirements [Contains As Low As Reasonably Achievable (ALARA) requirement]

3. **Conditional Major - Pollutants:**
   This facility is receiving a Conditional Major Permit to limit the emissions of HF below 9 tons per year and to ensure federal enforceability of radionuclide requirements.

4. **Conditional Major - Emission Limits:**
   To preclude application of Title V requirements, the source shall not emit more than 9 tons/yr of HF.

5. **Conditional Major - Control Device Requirements:**
   Critical operational parameters of scrubbers and filters will be established during initial testing and start-up and then frequently monitored to ensure facility's compliance with state and federal emissions requirements.

6. **Facility Location and Attainment Status:**
   This facility is located in McCracken County, Kentucky. McCracken County is classified as attainment for both PM_{10} and $PM_{2.5}$.

CREDIBLE EVIDENCE:

This permit contains provisions which require that specific test methods, monitoring or recordkeeping be used as a demonstration of compliance with permit limits. On February 24, 1997, the U.S. EPA promulgated revisions to the following federal regulations: 40 CFR Part 51, Sec. 51.212; 40 CFR Part 52, Sec. 52.12; 40 CFR Part 52, Sec. 52.30; 40 CFR Part 60, Sec. 60.11 and 40 CFR Part 61, Sec. 61.12, that allow the use of credible evidence to establish compliance with applicable requirements. At the issuance of this permit, Kentucky has only adopted the provisions of 40 CFR Part 60, Sec. 60.11 and 40 CFR Part 61, Sec. 61.12 into its air quality regulations.